Hardware mode controls		
PIN NAME	**PIN NUMBER**	**DESCRIPTION**
RESV	13	Reserved, Not Used
LRIP	12	LRCIN Polarity LRIP = H: LRCIN= H = Left Channel, LRCIN= L = Right Channel LRIP = L: LRCIN= L = Left Channel, LRCIN = H = Right Channel
CKO	11	CLKO Output Frequency CKO = H: CLKO Frequency = XTI/2 CKO = L: CLKO Frequency = XTI
MUTE	15	Soft Mute Control: H = Mute Off, L = Mute On
I^2S IW0 IW1	3 4 5	Input Data Format Controls **I^2S IW1 IW0 INPUT FORMAT** L L L 16-Bit, Standard, MSB-First, Right-Justified L L H 20-Bit, Standard, MSB-First, Right-Justified L H L 24-Bit, Standard, MSB-First, Right-Justified L H H 24-Bit, MSB-First, Left-Justified H L L 16-Bit, I^2S H L H 24-Bit, I^2S
SRO	27	Digital Filter Roll-Off: H = Slow, L = Sharp
OW0 OW1	19 20	Output Data Word Length Controls **OW1 OW0 OUTPUT FORMAT** L L 16-Bit, MSB-First L H 18-Bit, MSB-First H L 20-Bit, MSB-First H H 24-Bit, MSB-First
SF0 SF1	17 18	Sample Rate Selection for the Digital De-Emphasis Control **SF1 SF0 SAMPLING RATE** L L 44.1kHz L H Reserved, Not Used H L 48kHz H H 32kHz
DEM	16	Digital De-Emphasis: H = On, L = Off

DF1704
Soundplus™ Stereo, 24-bit, 96kHz 8× Oversampling Digital Interpolation Filter Digital-to-Analog Converter

Manufacturer

BURR - BROWN®

Burr-Brown, P.O. Box 11400, Tucson, AZ 85734,
U.S.A. Tel. (520) 746-1111, fax (520) 889-1510.
Internet: http://www.burr-brown.com/

Features

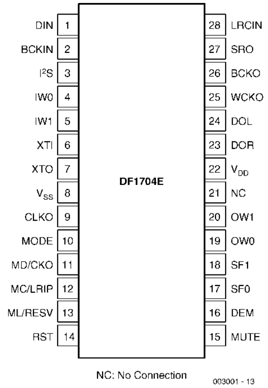
- COMPANION DIGITAL FILTER FOR THE PCM1704 24-BIT AUDIO DAC
- HIGH PERFORMANCE FILTER:
  - Stopband Attenuation: –115dB
  - Passband Ripple: ±0.00005dB
- AUDIO INTERFACE:
  - Input Data Formats: Standard, Left-Justified, and I^2S
  - Input Word Length: 16, 20, or 24 Bits
  - Output Word Length: 16, 18, 20, or 24 Bits
  - Sampling Frequency: 32kHz to 96kHz
- SYSTEM CLOCK: $256f_S$, $384f_S$, $512f_S$, $768f_S$
- ON-CHIP CRYSTAL OSCILLATOR
- PROGRAMMABLE FUNCTIONS:
  - Hardware or Software Control Modes
  - Sharp or Slow Roll-Off Filter Response
  - Soft Mute
  - Digital De-Emphasis
  - Independent Left/Right Digital Attenuation
- +5V SINGLE-SUPPLY OPERATION
- SMALL 28-LEAD SSOP PACKAGE

Application Example

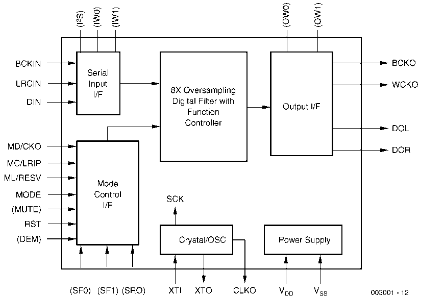
Audio DAC2000, *Elektor Electronics* November 1999 – January 2000.

Description

The DF1704 is a high performance, stereo, 8× oversampling digital interpolation filter designed for high-end consumer and professional audio applications. The DF1704 supports 24-bit, 96kHz operation and features user-programmable functions, including selectable filter response, de-emphasis, attenuation, and input/output data formats. The DF1704 is the ideal companion for Burr-Brown's PCM1704 24-bit audio digital-to-analog converter. This combination allows for construction of very high performance audio systems and components.



Pin configuration.



DF1704 bock diagram.

Programmable Functions

The DF1704 includes a number of programmable features, with most being accessible from either Hardware or Software mode. The table below summarizes the user programmable functions for both modes of operation.

FUNCTION	SOFTWARE (MODE = H)	HARDWARE (MODE = L)	RESET DEFAULT (Software Mode)
Input Data Format Selection	O	O	Standard Format
Input Word Length Selection	O	O	16 Bits
Output Word Length Selection	O	O	16 Bits
LRCIN Polarity Selection	O	O	Left/Right = High/Low
Digital De-Emphasis	O	O	OFF
Soft Mute	O	O	OFF
Digital Attenuation	O	X	0dB, Independent L/R
Sample Rate for De-Emphasis Function	O	O	44.1 kHz
Filter Roll-Off Selection	O	O	Sharp Roll-Off Selected
CLKO Output Frequency Selection	O	O	Same As XTI Input
Legend: O = User Programmable, X = Not Available.			

Hardware Mode Controls

With MODE = L, the DF1704 may be configured by utilizing several user-programmable pins. The following is a brief summary of the pin functions. The table below provides more details on setting the hardware mode controls.

Pins I^2S, IW0, and IW1 are used to select the audio data input format and word length.

Pins OW0 and OW1 are used to select the output data word length.

The DEM pin is used to enable and disable the digital de-emphasis function. De-emphasis is only available for 32kHz, 44.1kHz, and 48kHz sample rates.

Pins SF0 and SF1 are used to select the sample rate for the de-emphasis function.

The SRO pin is used to select the digital filter response, either sharp or slow roll-off.

The MUTE pin is used to enable or disable the soft mute function.

The CKO pin is used to select the clock frequency seen at the CLKO pin, either XTI or XTI ÷ 2.

The LRIP pin is used to select the polarity used for the audio input left/right clock, LRCIN.

Finally, the RESV pin is not used by the current DF1704 design, but is reserved for future use.

Pin Assignments

PIN	NAME	I/O	DESCRIPTION
1	DIN	IN	Serial Audio Data Input (3)
2	BCKIN	IN	Bit Clock Input for Serial Audio Data (3)
3	I^2S	IN	Input Audio Data Format Selection (2, 4)
4	IW0	IN	Input Audio Data Word Selection (2, 4)
5	IW1	IN	Input Audio Data Word Selection (2, 4)
6	XTI	IN	Oscillator Input /External Clock Input
7	XTO	OUT	Oscillator Output
8	VSS	—	Digital Ground
9	CLKO	OUT	Buffered System Clock Output
10	MODE	IN	Mode Control Selection (H: Software, L: Hardware) (1)
11	MD/CKO	IN	Control Data Input/Clock Output Frequency Select (1, 5)
12	MC/LRIP	IN	Control Data Clock/Polarity of LRCK Select (1, 5)
13	ML/RESV	IN	Control Data Latch/Reserved (1, 5)
14	RST	IN	Reset. When this pin is LOW, the digital filter is held in reset. (1)
15	MUTE	IN	Mute Control (1, 4)
16	DEM	IN	De-Emphasis Control (2, 4)
17	SF0	IN	Sampling Rate Select for De-emphasis (2, 4)
18	SF1	IN	Sampling Rate Select for De-emphasis (2, 4)
19	OW0	IN	Output Audio Data Word and Format Select (2, 4)
20	OW1	IN	Output Audio Data Word and Format Select (2, 4)
21	NC	—	No Connection
22	V_{DD}	—	Digital Power, +5V
23	DOR	OUT	Rch, Serial Audio Data Output
24	DOL	OUT	Lch, Serial Audio Data Output
25	WCKO	OUT	Word Clock for Serial Audio Data Output
26	BCKO	OUT	Bit Clock for Serial Audio Data Output
27	SRO	IN	Filter Response Select (2, 4)
28	LRCIN	IN	L/R Clock Input (f S) for Serial Audio Data (3)

NOTES: (1) Pins 10-15; Schmitt-Trigger input with pull-up resistor. (2) Pins 3-5, 16-20, 27; Schmitt-Trigger input with pull-down resister. (3) Pins 1, 2, 28; Schmitt-Trigger input.
(4) Pins 3-5, 15-20, 27; these pins are invalid when MODE (pin 10) is HIGH.
(5) Pins 11-13; these pins have different functions corresponding to MODE (pin 10), (HIGH/LOW).